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SUPERSALINITY OF THE BLOOD,

AN

ACCELERATOR OF SENILITY

AND

A CAUSE OF CATARACT.

BY

J. C. BURNETT M.D.

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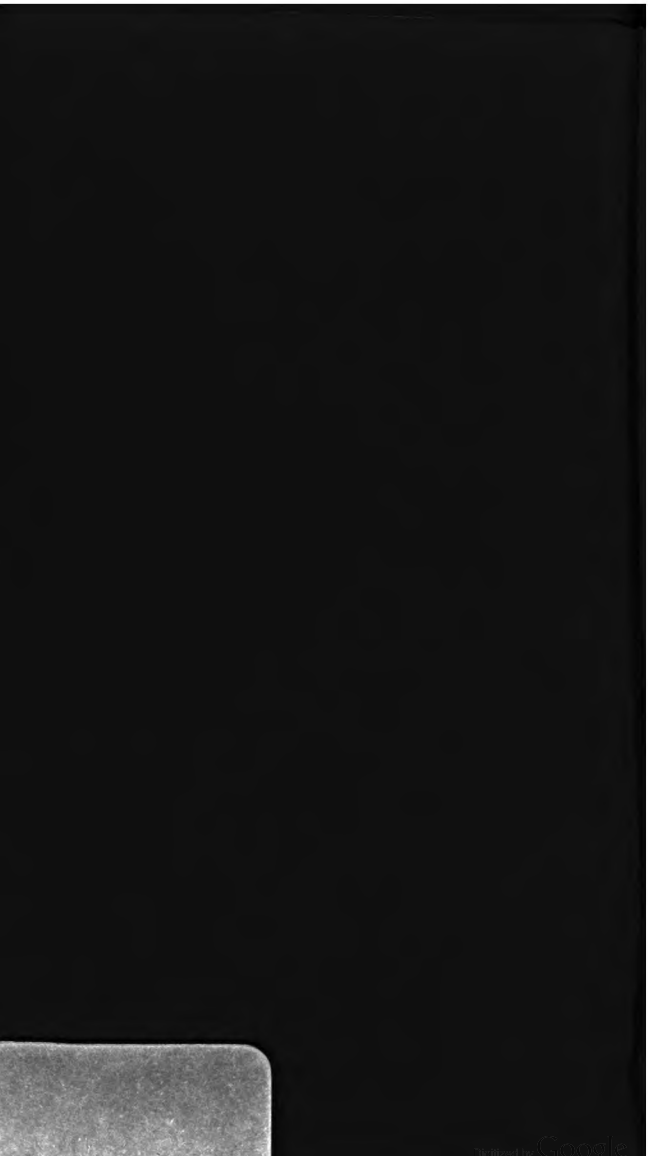
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J. COMPTON BURNETT, M.D.

"L'habitude émousse le sentiment."—BICHAT.

BIBLIOTHECA BODLEIANA AUG 1882

LONDON:
THE HOMŒOPATHIC PUBLISHING COMPANY,
2, FINSBURY CIRCUS, E.C.
BOERICKE & TAFEL, NEW YORK AND PHILADELPHIA.
And all Homœopathic Chemists and Booksellers.

1882.

151. o. 612.

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CHESTER:

EDWARD THOMAS, PRINTER, CAXTON BUILDINGS,

PEPPER STREET.

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PREFACE.

THE writer having come to the conclusion that the habitual use of *too much* salt has a drying-up, a senescent, effect upon the organism and that *some cases* of Cataract are likewise due to eating *too much* salt, he has brought together in the following pages some evidence tending to shew that such is, at least, extremely probable. The ingestion of *too much* salt renders the blood supersaline, and when in this state its specific gravity is too high and the tissues become too dry and hardened. The stroma of the lens being transparent and the lens within visual observation, we are able to watch any changes that may take place in its physical characters and if the lens become retrogressively metamorphosed we are warranted in concluding that what we see expressed in the lens is merely a sample of the quality of the other tissues which are beyond our field of direct observation. It

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is, of course, not maintained that *all* who partake of much salt necessarily become too soon senile, or that *all* cases of Cataract are due to eating too much salt, but that *some* cases only have probably that origin. Neither is the author able to say how much salt, or how little, a person in health should partake of, but that *too much* is distinctly deleterious he thinks he will be able to prove. And the direction of the change wrought by salt is clearly not of a juvenescent kind, whatever else it may be: for an opaque lens is not usually regarded as a youthful characteristic. The practical application of this view, if correct, is obvious. Any evidence on the subject, for or against, would be welcome. No single observer can settle any question, as he may be merely fondling a pet notion.

J. C. BURNETT.

5, Holles Street,
Cavendish Square, W.,
January, 1882.

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Supersalinity of the Blood: An Accelerator of Senility, and a Cause of Cataract.

A STUDY of the causation of Cataract soon brings one to a consideration of the drying-up effect of salt upon the lens and by deduction upon the tissues generally, and this leads us inevitably to think also of the salt-eating habit of mankind. I am myself a salt-eater, though I have no special fondness for salt; and I have always considered salt a very essential part of one's food This is the all but universally

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accepted view. But there are a few thinking persons, who not only call that view of the subject in question, but actually affirm that our much belauded salt is a great evil-doer. In fact, according to a fanciful few, it is nothing less than the forbidden fruit of earliest biblical times!

We will not wander away into this fancy-land, and it would be quite foreign to the object of this little treatise were I to enter into the broad question of whether salt is, or is not, a food; those who may be desirous of studying the subject of salt in this wide sense will find Mr. Boddy's "History of Salt" not wanting in useful information and strong language; for him "Salt is good," and that very emphatically so, and vituperation in plenty is

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poured on to the heads of the anti-salt people. At the other extreme, the late Dr. Robert Howard's "Consequences of the Use of Salt," may be read with advantage. Certainly salt is a very powerful agent and any thoughtful and careful observer may readily satisfy himself that not a few persons suffering from grave forms of disease are, and have long been, great salt-eaters; whether the salt has anything to do with their ill-health is not easily determined, but is certainly deserving of enquiry.

In these pages we shall keep as nearly as possible to the subject of the title: "Supersalinity of the Blood: an Accelerator of Senility, and a Cause of Cataract;" and we will try to avoid all controversy,

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and stick to scientific facts and logical deductions. We shall, however, throw in a few hints and queries here and there as they may suggest themselves; so that this little treatise may, if possible, prove suggestive to others.

Before proceeding, we had better arrive at an understanding with one another on two of the principal terms we shall use.

SALT.— By this is meant the common salt of our tables — the *Natrum Muriaticum* of old books, and the *Chloride of Sodium* or *Sodic Chloride* of the newer.

CATARACT means, for us, an opacity of the crystalline lens of the animal eye, and under the term lens we shall generally include also the lens-capsule.

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At first sight, it might appear a very simple matter to determine the effects of salt upon the animal economy, or upon any particular part thereof; but experience shews that such is not by any means the case. In almost every thing absolute certainty seems unattainable: many think salt eating a necessity of life, while others hold that it is a very hurtful habit. Many big books have been written thereon, but a really scientific treatment of the question has, as yet, hardly been attempted.

To begin with, the same substance affects different individuals differently; if not in kind, certainly in degree. For, generally speaking, salt in moderate quantities—say ten or fifteen grains at a meal—is well

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borne by any healthy adult or big child. It is said that an ounce at one dose has been known to prove fatal to a man, but it can hardly be maintained that an ounce is usually a fatal dose.—Certain persons are specially and peculiarly susceptible to the influence of certain substances, and these are the very people to be used as test-agents.

As an example of a person having an extraordinary idiosyncrasy as regards salt, I will give the following:—A friend, who had read my little monograph *Natrum Muriaticum as Test of the Doctrine of Drug Dynamization*, mentioned to me that a clergyman in a London suburb was unable to eat salt as it made him ill. This clergyman was kind enough at my request to call upon

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me to tell me about it, and at my suggestion wrote out the following account of how salt affects him—

"London, July 21, 1879.—I have from childhood been unable to take more than a very moderate quantity of salt. Of course I must take some every day, in bread, potatoes, &c., but I never add any to my food from my salt-cellar, or miss it if altogether omitted; and I have to be careful to avoid everything which is over-seasoned with it. Of course, I am seldom, or never "caught" now; and have to go back some years to remember the symptoms. In the first place, I find it difficult by the taste to distinguish salt from pepper in soups, &c. Both taste *hot* to me. The next sensation is that of burning in the throat and gullet. This is followed by dizziness and nausea, swelling and discoloration under the eyes, redness of the face, and a feeling such as, I imagine, those who have taken an irritant poison would experience. Raw brandy

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or strong vinegar relieves the immediate symptoms by causing violent sickness, but it is not for twelve hours or more, in the case of a good dose of salt (as from bathing in sea water,) that the system recovers itself, blood being frequently discharged both from the stomach and intestines.

"F. W . . . . . ."

From this descriptive note it may be seen that salt is a very violent poison to this gentleman; that is his peculiar idiosyncrasy. Is salt qualitatively the same to us all, we being able to withstand it; or is this gentleman in a morbid state? He appears to be in good health.

But although my object in these pages is to study the physical effects of salt on the economy generally,

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still this will be almost impossible unless we choose some special part of the body where its effect can with certainty be ascertained. For this the lens is peculiarly adapted as the sequel will prove; therefore instead of studying the general symptomatolgy of *Natrum Muriaticum* we will endeavour to shew how it affects the LENS, and, this done, we can deduce therefrom pretty certainly how it acts on the entire economy as a morbific agent, and this will give us also a therapeutic basis. Before proceeding I may be allowed to remark that the just-narrated case of salt idiosyncrasy demonstrates that a sea bath is a means of actually getting salt into the system. This point is of some importance, as the direct scientific experiment

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to prove it is all but impossible; but thus utilizing such a person with an idiosyncrasy against salt renders such experiment unnecessary. This proof that salt really enters the organism by means of sea-bathing has a significant practical bearing, for we can now with certainty prescribe salt in this form. But salt likewise powerfully influences the body when persons live at the seaside. This may be seen by observing the effect of sea air upon *certain* persons. Salt causes in some persons a deep crack in the middle of the lower lip; this symptom stands in the Hahnemannic pathogenesis—I saw a marked example of this lip-crack in an ancient mariner at Brighton last summer. Certain persons cannot live near the sea, as

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every observant physician knows. Some people get severe facial neuralgia at the seaside: they are commonly subjects of chronic psora. A lady of my acquaintance went last summer to Brighton with her children; she was quite well but rather low from nursing her sick children. The seaside air quite upset her, and brought on facial neuralgia: she thus described her symptoms to me, "I felt as though I were full of salt water, and when I took a small dose of *Natrum Muriaticum* 6 it increased the feeling and filled my mouth with salt water. If I dipped my hands into the children's bath of sea water it made my neuralgia worse. My lips always tasted salt while I was at Brighton." This lady finally, at the end of three

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weeks, became so ill that she had to leave the seaside and return inland where she at once recovered. It is a common observation that some people get obstinate constipation at the seaside, while others get diarrhœa. I have also noticed that a long residence at the seaside will cause a severe form of anæmia in certain idiosyncratic and delicate ladies, who finally sink into the condition commonly known as "decline," unless they are cured medicinally or removed inland-wards. Thus it is clear that "seaside" can be scientifically prescribed as a remedy.

Let us now return to our text. In studying the etiology and pathology of cataract some years ago, I went over the experiments

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of Kunde at second-hand. Latterly I have done so at first-hand, by procuring the important little reprint entitled *Ueber Wasserentziehung und Bildung Voruebergehender Katarakte von Dr. F. Kunde.** This "Abstraction of Water and the Formation of Transient Cataracts" should mark an era in the natural history of lenticular opacities. These important experiments were confirmed by Köhnhorn,† in Germany, in 1858, and by Dr. B. W. Richardson (The Synthesis of Cataract) two years later in England.

* From the *Zeitschrift f. wissensch. Zoologie von C. Th. v. Siebold und Kölliker. Viij Band*, 4 *Heft*, 1857.

† *De Cataracta Aquæ Inopia Effecta. Dissertatio Inauguralis Gryphiswaldensis, Anni* MDCCCLVIII.—*Auctor Conradus Köhnhorn.*

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Intervening between Kunde and Köhnhorn and Richardson are the experiments of Dr. S. Weir Mitchell, as set forth in his paper in the American Journal of the Medical Sciences for January, 1860, these I have not read but they were, it appears, with sugar, and do not concern us here. More than twenty years have elapsed since Kunde did these experiments shewing that a form of cataract can be produced in the lower animals by the ingestion of salt, and yet I have never read or heard of their having raised the question as to whether this substance, which almost everybody eats with his daily food, may be accused of producing cataract or of otherwise deteriorating the general state of the human tissues. This subject has

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occupied my mind at odd intervals during the past few years, and I have been trying to solve the problem. That salt will actually produce cataract in the lower animals has been experimentally demonstrated and experimentally confirmed. If, now, we could try the direct experiment on man, the question would be settled thereby definitely; but there are difficulties in the way: there are no human beings who would give themselves up for the experiment, and even though there were, it might be thought unjustifiable. Failing, therefore, the direct experiment, we must proceed deductively and clinically. Cases of idiosyncratic persons are to me most instructive for I regard such as delicate re-agents of great value, but

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many will reject all such cases as unscientific and fanciful. They must, however, accept the data obtained by the direct experiment. Therefore let us start with a consideration of the experimental proof of Kunde that cataract can be produced in healthy animals by salt introduced into their bodies.

Kunde's Experiments.

Kunde enters upon his subject by remarking that the greater part of the earth's crust is made up of water, and hence it is no wonder that the products of this earth's crust, man and the lower animals, as the quintescence of earthly materials, should also consist principally of water. Wherever organic

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matter is to maintain itself, or the inorganic is to become organized, there must be water, for no chemical process can take place without its aid. *Corpora non agunt nisi fluida.*

Every animal, he asserts, is only in a normal condition when it takes up a definite quantity of water into its organs, and we should certainly get a clearer conception of many physiological and pathological processes if we were able to determine the quantity of water normally held by any given organ.

Whether we look upon water as a solvent, as imbibitionary material, or, probably, as a chemical agent, it plays such an important part in the functions of the organism that a plus or a minus of it must be of the greatest consequence.

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But, unfortunately, we do not know how much water must be present to constitute the physiological norma.

We have been so long accustomed to look upon water as an indifferent body that we require to be reminded that water may be an exceedingly deleterious stuff.

Kunde then passes to a consideration of Eckhardt's Theory "that a concentrated solution of salt abstracts water from the nerves, and thereby causes twitchings of those muscles which they innervate," and suggests that a chemical action may have something to do with it.

A nerve deprived of too much water ceases to react, but *takes on its function again as soon as the necessary quantity of water is*

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restored to it. But too much water also deprives the nerve of the power of reacting.

Kunde proceeds to shew that if a living frog be deprived of too much water it dies. But if the process be stopped at a certain stage and the half-dried-up animal be placed in a moist atmosphere, it comes round again completely. The lethal point is not so much determined by the absolute quantity of water that is abstracted, but by the time occupied by the process; the organism can accustom itself to a considerable loss of water, provided it be abstracted slowly. To prove this Kunde instituted various experiments on frogs by drying them in a draught, or in very dry air, and then restoring the humidity,

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or not at will. If they were kept in the dry they died, but if restored to a moist place they gradually recovered. But this drying process is a slow one, and so Dr. Kunde bethought himself of another and more rapid way of abstracting water from the living organism. He says, "There is a means of abstracting water from animals in a very short time, and that is SALT." He made use of rock-salt in substance, putting it either into the stomach or rectum, or under the skin. After its application the animals were convulsed* so violently that it almost approached to tetanus, but he only observed tetanus once in

* Hence the homœopathicity of *Natrum Muriaticum* to certain convulsions. Query —Are the spasms of hydrophobia due to

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many hundred cases. The next important symptom to the convulsions was *sweating*, followed by profound debility, exhaustion, paralysis, and death. When the salt was applied under the skin, a large quantity of fluid collected under the skin, but there was no such action in the intestines unless the salt was put either into the stomach or rectum. Put into the stomach it caused considerable hyperæmia of the mucous lining of the mouth, vomiting, secretion of bloody mucus from stomach and bowels, and the animal would soon cease to breathe. But if the animal was put

want of water in the nerves? The mode of death from hydrophobia is similar to that of a small animal from salt-poisoning; so are the *ante mortem* symptoms.

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into water all these phenomena soon ceased. We may fairly compare the effects of salt on these frogs and those symptoms observable in the idiosyncratic clergyman mentioned just now. And this is interesting also as bearing on the fact that salt, as we all know, causes thirst, for we can now see why it does so. Salt causes a loss of fluid, and it must be replaced, or mischief ensues. But even left in the air a frog poisoned with salt can yet come round under favourable circumstances. Dr. Kunde's object with these experiments was not to study the effects of salt on the animal organism; but he was studying the effects of loss of water thereon, and he made use of salt as a rapid means of depriving the animals of

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this fluid, but in the course of his experiments he observed the formation of cataract as one of the effects of the salt, and he thus describes his important discovery (p. 9).

KUNDE'S GREAT DISCOVERY.

"If you take a frog weighing 30 grammes and give it a 0·2–0·4 dose of salt either under the skin or in the rectum, you will, in a short time, observe a bulging out of the cornea, with an increase of the aqueous humour, and, sooner or later, *an opacity of the lens*, which will begin sometimes anteriorly and, at other times, posteriorly. This opacity increases in proportion as the animal gets weaker, and attains

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to such a degree at last that the lens takes on a light ash-gray appearance."

The value attached to this cataract formation by Dr. Kunde is primarily, because it affords a means of judging how far the poisoning with salt has progressed; for, says he, you can pretty well judge from the look of the lens in which stage of the poisoning the animal is, and whether it be still possible to stop the poisoning and restore the animal to its normal state. If not carried too far all the symptoms disappear when water is slowly restored to the organism, and then the salt cataract also disappears.

He concludes—" We can therefore succeed, by the alternative

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abstraction and restoring of water, in producing and causing to disappear, in the same animal, opacities of the lens and paralysis of the nerves."

And he thinks that the organs are only able to perform their functions when they have a certain amount of water, and that the presence of a superabundance of salt in the organism is not felt so long as it contains sufficient water. The nitrate of sodium has precisely the same effect on the lens as the chloride, but the nitrate of potassium does not, according to Kunde, cause any lenticular opacity.

Kunde is compelled, by the results of his experiments, to admit

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that salt is a powerful poison to the animal economy, or at any rate a very deleterious substance. How, then, is to be explained the fact that so many partake of such large quantities of salt without any *apparent* ill effects? We say in English that habit is second nature, and the Germans express the same thing in their proverb, *Die Gewohnheit ist des Menschen Amme, i.e.,* habit is man's nurse; and Kunde adopts Bichat's saying *L'habitude émousse le sentiment* as explanatory hereof At any rate we may learn herefrom the practical lesson that those who eat much salt must necessarily drink much fluid. Therefore in the case of inebriates salt should be forbidden. And anyone may observe for himself that thirsty souls use much salt with

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their food. Now, Hartwig gave large doses of salt to horses, cows, and dogs, and observed the following phenomena: Convulsions, coldness* of the whole body, paralysis, and even death. Kunde noticed paralysis in the hind legs of guinea pigs to which large doses of salt had been given; and young cats, weighing from one to two pounds, would get vomiting, convulsions, paralysis, and even die from doses of only one or two grammes. (Schüssler is, therefore, homœopathically correct in recom-

* *Coldness* is a capital and characteristic indication for *Natrum Muriaticum* and which I have very often verified clinically, but, to be curative, it must be administered in dynamic dose. (see my little monograph on this drug.)

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mending *Natrum Muriaticum* in "vomiting of *watery* stuff.")

On the other hand, some people can undoubtedly partake of a considerable quantity of salt and seemingly remain in good health.

We may now note more fully the effects of salt upon the eyes of cats and other animals.

Two grammes of rock salt was introduced into the stomach of a young cat and it killed her in three hours, but the lens had turned opaque before death; the aqueous humour was increased; the iris was paralysed at the end of two hours, so that the strongest sunlight had no effect on the pupil

Two other young cats, each one twelve days old, got each about a

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gramme of rock salt per rectum, and the anus being tied up; in two hours cataract had formed in each in both eyes.

Kunde repeated the experiment many times, but always with the same result: the lens became opaque. This may be a purely physical phenomenon or chemical. Kunde thinks it is due to the abstraction of water. In any case, it is certain that salt causes a beclouding of the lens-substance

Let us now consider one or two of Kunde's experiments in detail; their study will repay the trouble—

A frog, weighing 54·5 grammes, had on Friday at 10-50 a piece of rock salt weighing 0·32 grammes put into its rectum, and was placed

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under a dry glass globe. The temperature of the room was 16° R. At 11-20 there was a beginning opacity in the anterior part of the lens (Linsenwand). Considerable secretion of fluid. At 11-55 considerable opacity of the lens. The frog was rather debilitated, but still hopped about. It was put into water. At 4-15 *status normalis.* The opacity of the lens had disappeared. At 4-45 a fresh portion of 0·36 Cl. Na. was placed in the rectum and the frog put into the dry. At 5-35 considerable opacity in the anterior part of the lens. The animal was exhausted, for being placed on its back it had not the power to get up. Pulsation of the lymph-hearts barely visible. Heart beat and respiration still pre-

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sent. Sensibility much diminished. Its toes being sharply pinched it made a little jump. It was put into water. At seven o'clock the opacity had diminished and the animal was more lively. On Saturday morning at 8-40 the animal was in its usual health. No trace of opacity of the lens. Again 0·365 Cl Na put into the rectum. At 9-15 the opacity had again begun. At 10 o'clock the lens was ash-gray. The animal did not stir when laid on its back. Sensibility almost entirely lost, mechanical and galvanic irritation only fitfully responded to. The lymph-hearts had ceased to pulsate. Heart-impulse no longer visible, but could be felt. No respiratory movements. The animal was put into water. Sunday

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morning at 7-30 the animal was in its usual health. There was just a trace of lenticular opacity at the back part, but this also disappeared.

Now let us give a couple of experiments with cats.

Two grammes of rock salt was put into the stomach of a cat weighing one pound four ounces. In three hours the animal was dead. In the interim an opacity of the lens had become developed, and on the surface of this opacity the usual tripartite figure could be seen. The aqueous humour was increased. Two hours after the salt was given the iris was already paralysed so that the strongest sunlight produced no reaction.

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Two other kittens, each twelve days old, got each about a gramme of salt put into the anus which was then tied up. Already in two hours cataracts had formed in both eyes.

These experiments were oft repeated and gave always the like result.

Kunde did not succeed in producing cataracts in coneys.

We need not follow these experiments any further; our point is proved: Salt is capable of producing cataract in frogs and cats.

Kunde finally concludes from his many experiments:—

1. A very slight increase in the quantity of salt in the blood is capable of producing considerable changes in the optic media.

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2. The lens is being constantly changed.

3. The exchange of fluids in the lens extends to its deepest layers.

To those who know that Kunde in these experiments was aided and controlled by Kölliker, Virchow, H. Müller, and von Graefe, it will be quite needless to offer evidence confirmatory of his conclusions.

Köhnhorn's Experiments.

That this startling discovery of Kunde, that the ingestion of common salt is capable of producing cataract, should at once arouse further enquiry in science-loving Germany is what every one would

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anticipate. Accordingly we find the Westphalian student Köhnhorn going over the same ground soon afterwards choosing it for the subject of his graduation thesis which is entitled *De Cataracta aquae inopia effecta* (Gryphiae MDCCCLVIII.) The eminent physiologist Budge led him to undertake the experiments and aided and controlled him. Köhnhorn arrives at substantially the same conclusions as Kunde: Salt introduced into the bodies of certain of the lower animals produces cataract of the lens, but he did not observe any increase in the quantity of the aqueous humour of the anterior chamber of the eye. With Kunde the cornea bulged out, supposedly in consequence of the increase of

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the aqueous humour, but Köhnhorn says he often observed that the cornea was very flat, and hence he concludes that the aqueous humour is diminished in quantity: those who are familiar with experimental pharmocology will understand that both conditions may obtain according to circumstances and idiosyncracies I will not detail the experiments of Köhnhorn, but will merely give one sample-experiment performed by him on frogs. (p. 10.)

Frog A, weighing 30·275 grammes got, *per os*., 0·12 grammes of salt with the result that already in four hours the lens became opaque and the opacity increased as time went on, and beginning sometimes at one part of the lens and sometimes at another and being in colour

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either snowy-white, yellowish, or ash-gray.

On the twelfth page of his dissertation Köhnhorn narrates the following very curious fact, which besides being very curious is also, from the stand-point maintained in this little treatise, especially instructive. He quotes from the *Ephemeris Guestfalica*, which I think means the Westphalian newspaper press, or it is perhaps a special publication. "Königshorn, March the 12th (year not given, but it is probably the year of the date of the thesis, namely, 1858). The Sesecke or Siske takes its rise above Unna and debouches into the Lippe near Lünen. This burn, at that part of its course which is near Camen, contains so many

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bleaks, or blays, [Bleier] a kind of whitefish, that the inhabitants of Camen get a nickname therefrom. But now a circumstance has occurred which will render this nickname of doubtful application. Already as long as twelve years ago a spring in connection with our salt mine one day discharged such a quantity of salt lye into the Sesecke that the blays, which are solely a fresh-water fish, entirely disappeared. After years of litigation the owners of the salt mine had to pay respectively eight hundred and one hundred and twenty thaler damages to two owners of fishing rights in the Sesecke. The same thing has occurred again lately, but a great deal worse. The fish, not only blays, but also pike and perch, swim

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about as if stunned and can be caught with the most primitive kind of tackle. Single individuals having landed as much as half a hundred weight in one day. Experts declare that these fish are not stunned but *blind;* for when they hit against anything they at once seek to escape in the opposite direction. Ill they certainly are for they can only stand this condition a few days, and then they die."

Köhnhorn opines that these fishes were first rendered blind by the formation of cataract, and then finally succumbed, and the large amount of salt thus conveyed to the river is credited with being the cause. Proved, of course, it is not; but it is extremely likely.

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Richardson's Experiments.

Before closing this part of our subject we will just glance at the confirmatory experiments of Dr. B. W. Richardson, F.R.S., who about the year 1861 published the results of his experiments under the title of the "Synthesis of Cataract." The copy from which I quote is apparently a reprint from a French source. The experiments were performed in 1860, and Dr. Richardson's first communication on the subject was to the Medical Society of London in that year, but the first were with the sugars.

There is one important difference between these experiments: Kunde and Köhnhorn used rock salt in substance as we have already

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seen, whereas Richardson made use of saline solutions, so that Kunde's and Köhnhorn's results were not due to the anhydrous condition of the salt. Let us take one or two of Richardson's experiments : On April 10, at 4 p.m., three drachms of a solution of chloride of sodium, of specific gravity 1.150, were injected under the skin of a large frog. The creature became immediately tetanic. The limbs were drawn up forcibly to the body ; and in twenty minutes the whole body was fixed ; at the same time there was a constant and general twitching of the muscles,—jactitation—which continued actively for an hour, although the animal itself seemed to be really dead. Previous to death, indeed within fifteen

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minutes after the injection, there was opacity of the lens on both sides, and the lenses assumed a denseness and a peculiar whiteness such as he had not before seen. The appearance was more like that of a lens which had been subjected to boiling than aught else. On removing the cornea he found it clear and the parts surrounding the lenses also clear. On making section of one lens, it cut firmly, and the opacity was extended throughout its structure from the circumference to the centre. The other lens, submitted to water, became soft in structure but not clear.

On April 10th, at 4-15 p.m. two drachms of the solution of chloride of sodium, of specific gravity 1.150

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were injected under the skin of another frog. The animal was immediately convulsed, and in twenty minutes was tetanic. Death occured in a little more than an hour after the operation, jactitation of the muscles continuing to the last. The opacity of the lens on each side commenced within half an hour after the injection, and continued rapidly to increase to total eclipse of vision. The change in the lens was identical with that which had been observed in the last experiment.

Richardson's other experiments had a like result, viz., the lenses became opaque, and the opacities slowly cleared up when the creatures were put into water. Other saline solutions likewise

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produced cataracts, viz., chloride of ammonium, chloride of potassium, lactate of soda, carbonate of soda, carbonate of potassa, and sulphate of potassa, but the phosphate of soda gave a negative result, as also did blood serum.

The chloride of calcium and the chloride of barium also rendered the lenses opaque, but the iodide of potassium did *not*.

Dr. Richardson also got Mr. Miller, of Bethnal Green, to place a pig under experiment for him, Dr. Ritchie making notes of it. The pig at the commencement of the experiment was in good health. It was placed alone in a sty, and was fed on the ordinary food for fattening these animals—a solution of common salt having been made,

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consisting of two ounces of salt in six ounces of water, one ounce of the solution was added to the food each day from the 18th to the 24th. From the 24th to the 30th one ounce and a half of the solution was given. Up to this time it was observed that the animal, although taking food as usual, did not improve in condition. The crystalline lens in each eye continued clear. On May 1st, the dose of the salt solution was increased to four ounces daily, and on the 3rd to six ounces. On the 7th, four ounces of undissolved salt were added to the food, and this quantity was continued daily until the 19th. The animal ate its food well and showed no sign of being affected by it About the 11th Dr. Ritchie *thought there*

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was some lenticular dullness, but this effect soon passed off. The skin also remained free of blotches, and the strength of the animal remained as usual. The only change that could be observed was that he did not increase in weight and fatness like other animals fed at the same time and place on the same kind of food without the common salt.

Dr. Richardson's experimental summary is pregnant with significance from our present stand-point. He says: "It is to be observed that the success of the experiment in producing the cataractous condition turns on the specific gravity of the fluid injected. It required, in every example, that the specific gravity should exceed

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1,045, in other words that it should exceed the specific gravity of the blood. But so soon as a condition of the blood was attained, so soon as the circulating fluid could afford secretions, having an abnormal density, then the cataractous change was induced, and lasted so long as the blood retained its abnormal state."

We have seen that Kunde and Köhnhorn regard the lenticular opacities as due to mere exsiccation, but Richardson says: "The mode by which the cataractous state is produced must be accepted, I think, as osmotic in character, *i.e.*, as a direct physical effect on the lens through its surrounding and internal fluids, by which the arrangement of the lens, fibres, or tubes is changed. I

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have confirmed the observation of Dr. Mitchell that this effect is distinct from that of mere exsiccation." It is a pity that Dr. Richardson does not tell us *how* he wrought this confirmation; to my mind it is indeed an exsiccation. for, else, why should the opacity disappear when water is added?

And regarding the relations of these researches to cataract in the human subject, Dr. Richardson very sensibly remarks that no synthesis could be more perfect than that of cataract, and it is therefore impossible not to see that a relationship exists between the artificial and the natural disease. This is now admitted in regard to artificial sugar-cataract and diabetic cataract, but the production of arti-

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ficial cataract by salt has heretofore led no one to suggest the possible connection of the salt-eating habit of mankind and the presence of cataract in the salt-eaters.

It is true that Dr. Richardson thus concludes: "Neither must we, in fairness, confine ourselves to the mere idea of sugar cataract from osmotic cause. It must be remembered as the primitive fact, not only that the increase of the specific gravity of the fluids of the eye by *sugar* will destroy the refracting power of the lens, but that, whatever soluble substance will increase the specific gravity of the fluids, will induce the same condition. THERE MAY BE THUS SALINE CATARACT AS WELL AS DIABETIC." [The small capitals are mine.]

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Here we see that Dr. Richardson arrives at the possibility of the existence of salt-cataract by induction from his experiments on the synthesis of cataract aided by a knowledge of the long-known existence of sugar-cataract, but whether he is thinking of a saline cataract from a salt-disease of the body, analogous to the sugar-disease or diabetes, or of a salt-cataract from eating salt does not appear, but he must, I should suppose, have had the salt-eating habit in view, for salt is an inorganic substance and could hardly be made within the the body. I may say that when I conceived the idea of this little treatise I had never seen Dr. Richardson's *Synthesis of Cataract*, and I had nearly finished my MS. before

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I came across this remarkable sentence of Dr. Richardson's, "*there may be thus saline cataract as well as diabetic.*" It occurs to me to write to Dr. Richardson to ask what his meaning was, and if I get a reply before this quite leaves the press I will append it.

[I am glad to be able to clear this point up before this leaves the press. I wrote on January 30th, 1882, to this great physician and greater physiologist suggesting whether he meant that there must exist in man a salt-disease analogous to the sugar-disease or saccharine diabetes. Dr. Richardson very kindly at once replied to my suggestive query and for which I beg hereby publicly to thank him.

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The answer runs thus:

"25, Manchester Square, W.
January 31, 1882.

DEAR SIR,—You have correctly divined what I meant. I was of opinion, when I wrote the paper you name (and I am of the same opinion still) that there is a cataract produced by the accumulation of some saline substance in the blood.—

Faithfully yours,
B. W. RICHARDSON.

Dr. Burnett."]

This settles the point, for my contention is not that there exists a saline substance which, by accumulating in the blood, causes cataract; but that eating too much salt, or salt-containing food, acts upon the human lens *as salt*, just the same as the above narrated experiments shew in regard to certain animals. I do not admit the existence of any

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"saline substance" but I lay the blame upon the salt itself: its physiological effect is to dry up, and when any portion of the living tissue gets too dry then, if the exsiccation persists, the vital state of the tissues is altered and morbid metamorphoses may ensue. It has long been clinically known that many diabetic patients suffer from cataract, and this variety is now commonly called diabetic cataract, and its dependence upon a constitutional condition is admitted. It follows that diabetic cataract should be treated constitutionally, dietetically, and by medicines, and not extracted. This paper will throw some further light on the pathology of cataract tending also in the same direction. Let us, therefore, hope that we are near

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the dawn of a new era in the treatment of cataract generally.

Now as to the general effect of salt upon the body—the senescent effect as I shall call it—Dr. Richardson's remarks are important. We have seen that he says that the artificial cataract formation depends upon the specific gravity being higher than that of the normal blood: "so soon as a condition of the blood was obtained, so soon as the circulating fluid could afford secretions, having an abnormal density, then the cataractous change was induced, and lasted so long as the blood retained its abnormal state."

He continues: "This fact was further brought out by those ex-

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periments in which the opacity of the lens was either quickly removed, or was prevented altogether by the immersion of the animal in water."

And then: "The fact was further supported by the general effects of the dense fluid on the tissues of the body. There was scarcely a case in which the lenticular opacity was strongly marked in which there was not therewith *a shrinking of the tissues*, followed in most cases by convulsion, amounting even to tetanus."

That is just the condition in certain senile changes: the tissues shrink, become dense, dry and semi-mineralised.

Let me now approach the subject analytically and from the clinical side. It was a *clinical* observation

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that led me first to think of the possible connection of salt-eating and cataract, as I will presently relate. The connection of cataract and saccharine diabetes was known and taught years ago by Dr. Craigie, of Edinburgh. And Mr. France, Günzler, Hastner, Arlt, von Gräfe and others had demonstrated the thing clinically long before the saccharine synthesis of cataract had been physiologically proved.

THE PROBABILITY OF THE EXISTENCE OF SALINE CATARACT IN THE HUMAN SUBJECT.

Up to this point I have mainly considered the subject inductively; we will now pass on to its clinical

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aspect, and then draw our conclusions from analogy. We have noticed that the existence of diabetic cataract was long known clinically before Kunde, Köhnhorn, Weir Mitchell, and Richardson showed that sugar is capable of producing lenticular opacities.

When I first fell to working out the thought that *salt-eating* might play a part in the causation of cataract I had not yet, as before stated, read Richardson's surmise that there may be such a thing as *saline* cataract; and I did not then know whether he refers to salt-eating or not. His letter shews that he was not referring to the salt-eating habit of mankind but to some hypothetical saline substance accumulating in the blood, and as twenty years

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have elapsed since the publication of the "Synthesis of Cataract," it is evident that this thought has not yet borne any clinical fruit, at least, so far as I have read, no *saline disease* has as yet been demonstrated or even surmised except by Dr. Richardson. Indeed, unless the possibility of the curability of cataract by medicines be admitted and taught, and this is not the case, all the physiologists and bio-pathologists of the world will work in vain at its synthesis.

I was first led to surmise the possible connection of salt eating and *a variety* of cataract by the following incident:—

Early in the year 1879 I was conversing with a lady on the subject of salt eating; she had

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cataract of the right eye, and I had been treating her for it for a good while with no very great benefit, and she was telling me about the clergyman whose strange susceptibility to the influence of salt I have narrated. Observing that her right eye *watered* a good deal, I said "Are *you* fond of salt?" and learned to my astonishment that she was extremely partial to it, *being in the habit of putting salt into her drinking water at dinner after the pudding*. As nearly as I remember she took almost a teaspoonful to a tumblerful of water! I recommended her to discontinue this practice on account of the power of salt to produce cataract in the lower animals; she followed my advice, and her

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cataract at once began to improve, and six months later she could see quite well with the eye. She was taking *Dulcamara* 3 a part of this time. The *watering* of the eye was the first symptom to disappear.

It seems to me probable that her cataract was due to her salt-eating; but this, of course, cannot be proved.

According to Dr. Richardson's experiments, the formation of cataract begins as soon as the specific gravity of the blood has been raised above the normal sufficiently to admit of secretion and consequent osmotic change.

After this I did not think much of the part played by salt in the synthesis of cataract, but in taking the cases of cataract patients during the past few months I gradually

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got into the habit of asking my patients the question . . . Are you fond of salt? The answer to this question is very frequently, though not always, in the *affirmative.* Let me give you some examples. I will not give very many—indeed I could not if I would, for I have not thought of the subject sufficiently long for that — because it will not be possible for me to *prove* my proposition. If I were able to bring a thousand such cases, it would still, at the best, be only a question of probabilities; however, these which I do bring have been sufficient to carry conviction to *my* mind. A conviction, namely, that inasmuch as salt can cause cataract in animals, it is barely conceivable that the same substance can be

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ingested by human beings in largish portions during many years with no effect at all. Granting that no effect was permanent in the animals so long as there was enough water within the organism to carry it off; still there must, in all likelihood, arrive a time when the in-put of salt will exceed the out-put, and then human salt-eaters must necessarily be in the same plight as Kunde's frogs and cats.

FIRST OBSERVATION. — Miss ———, fifty-two years of age, came under my observation in January, 1881, suffering from cataract of both eyes. It had been several years coming, and the appearance of the iris, a beclouded blue, is peculiar. *She is rather fond of salt.*

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SECOND OBSERVATION. — Miss ———, about fifty-five years of age, came some time ago under treatment for cataract and very severe chronic dyspepsia. She had scars on the neck, and her eyes were very susceptible to the cold air. *As a child she was a very great salt eater*, and still eats it, but no longer cares specially for it. She was weaned of this excessive fondness for salt by the advice of a physician she thinks. Having taken such a large quantity of salt in her early years, and a moderate quantity of it ever since, it is likely that the salt may have aided in the production of her dyspepsia and of the cataract. She is still under my care and improving a little.

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THIRD OBSERVATION. — Mr. ———, has been under my care for several years, off and on, with hæmorrhoids, prolapse of the rectum and cataract of both eyes, much worse in the left. With his meat he takes "*Sunday Salt;*" he always eats salt, though not excessively he thinks. He is between seventy and eighty years of age, and otherwise hale and active, but he is in a very *mineralised* condition; and at his age, of course, everybody is more or less so. For many years he has been in the habit of drinking a strong *saline* aperient, a portion of every summer. If salt can cause cataract at all one might very naturally attribute that in this gentleman to its effect, for besides

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the daily use of a "moderate" quantity, he must have imbibed many pounds of salt in his long-used *saline* aperient.

FOURTH OBSERVATION.—Miss ———, seventy-four years of age, came under my care a short time since with a mature cataract of the left eye and an incipient one in the right one. She is very subject to diarrhœa and *eats a great deal of salt.* On July 21, 1881, I ordered her pilules of *Natrum muriaticum* 30. One pilule night and morning. She, however, had to discontinue them as they upset her so much. She did not know what she was taking. She is a hale old lady, and fresh for her age. It might, not unnaturally, be objected to my theory—that much salt has a senes-

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cent effect upon the economy—that this case militates against it, or even overthrows it entirely. But I call attention to the fact that she is *very subject to diarrhœa*, and hence the organism may have cast out the surplus of salt by the bowels, indeed must have done so to a large extent.

FIFTH OBSERVATION.—The Rev. ———, sixty-four years of age, came under my observation a short time since. He is a scientific man, and has devoted not a little attention to the eye and to optics on account of being himself the subject of cataract of both eyes. His case is one of very unusual interest, and I must notice that his eyes began to fail twenty years ago, and that he had *purpura hæmorrhagica* six years later. He is a great egg-

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eater, partaking daily of two regularly, and with each he takes a *small teaspoonful of salt.* Other than with eggs he is a moderate salt-eater only. But is it *probable* that two small teaspoonfuls of salt taken daily for a long period could have had *no* effect in causing the lenses to degenerate?

SIXTH OBSERVATION. — Mrs. ———, sixty-one years of age, came under my care a few weeks ago with a skin affection, double cataract, dyspepsia, pyrosis, palpitation, and alopecia As to *salt*, she tells me she is a *big salt eater*, partaking of two good salt spoonfuls at each meal.

Although not directly bearing on the present subject, still I cannot omit to interpolate here a note or

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two of a young lady whom I have long treated for complete suppression of the menses. Except this she complained of nothing beyond some indigestion. Having prescribed various remedies with such scant success, I enquired very *closely* into her mode of life, and elicited the certainly interesting fact that she had been a very great salt-eater for eight or nine years. She eats about two teaspoonfuls of salt a day, and actually puts salt into her *coffee!* She is very chilly. The salt-eating habit of this young lady may have had nothing to do with her menstrual suppression, but liking salt to such a degree that it is taken in coffee is, at least, a curiosity.

It will not be possible for me to give an exact scientific proof that

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salt-eating actually *does* cause cataract in man, but if I bring a certain amount of evidence tending to its proof, I may induce other practitioners to investigate the subject, and those who happen to have cataractous lenses, being largish salt-eaters, might leave off the habit and try the effect of the change.

I take here the opportunity of stating that practical information on the subject would be welcome to me. The question is too difficult for any *one* person to *settle*, but a careful and unprejudiced investigation of the question cannot fail to be of advantage to mankind and to science.

I will now return to my case book and give a few more observa-

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tions on the subject of the coincidence of fondness for salt with the presence of cataract.

SEVENTH OBSERVATION.—Mrs. ———, *aet.* 61. formerly a patient of Dr. P——, came under my observation in September, 1881, with cataract of both eyes. She first noticed something the matter with her eyes five or six years ago, when Dr. P—— diagnosed lenticular opacities. She was waiting for the cataractous process to mature, when a friend of hers got cured of cataract under my care, and this determined her to try homœopathy in her own case. She had watched her friend's case, and would have sought the aid of homœopathy before, but her brother,

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an allopathic physician of standing, laughed her out of it. But I am digressing : Mrs. ———, has cataract of both eyes, worse in the right, and *she is a big salt-eater*, she *likes salt* very much, and *eats two good saltspoonfuls* thereof at a meal. Besides being fond of salt she is also partial to eggs and also to pepper. On my recommending her to give up salt with her food, she declared it would be impossible, as she was sure she could not live without it.

EIGHTH OBSERVATION. — Mrs. ——— came to me in November, 1881, from a provincial town, complaining of her eyes. She informed me that she had had rheumatic fever twice, the last time about five or six years ago. Ever

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after this last attack her eyes failed her, first the left and then the right one. Was for some time under Mr. B——, who, eighteen months ago, diagnosed incipient cataract of both eyes, which is now readily demonstrable with the ophthalmoscope but not with the naked eye. Patient is now fifty-two years of age; is partial to sweet things, and is *decidedly fond of salt*, eating, at a rough guess, about a teaspoonful of salt a day with her food.

NINTH OBSERVATION. — Mrs. ———, *aet.* 62, came under my observation on December 1st, 1881, suffering from opacities of both lenses. She thinks they began four or five years ago after a carriage accident: the horses bolted, she became alarmed, and jumped

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out of the carriage and received a great shock to the cerebro-spinal system. She was long indisposed thereafter with notable neural symptoms. The drinking water of her house is very hard; she is very fond of sugar and consumes a good deal of salt, although she is really not partial to salt she says. But experience has taught me that "fondness of salt" may be in all good faith *denied*, and yet the person so denying the soft impeachment may in reality partake of a great deal. Thus Mrs. ——— says that she is *very* partial to *salt* herrings, and eats a great many of them. Moreover she uses salt at every meal; she puts it on her plate, and, besides, she makes use of a *muffineer* (a salt cellar with a

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perforated top like a pepper box) and sprinkles salt upon her bread and butter and vegetables, &c. Her own estimate of the quantity of salt she consumes daily is one teaspoonful, but she does not admit any special fondness for salt. Of course it is not so much the *fondness for salt* that comes into consideration, but the *quantity of salt actually eaten.* Three hundred and sixty-five teaspoonfuls of salt eaten every year and year after year, not to mention the *salt* herrings, may fairly be charged with the power of affecting the lenses, especially *after* a severe traumatic shock. Naturally I can *not prove* anything of the kind; the direct scientific proof is impossible, and trauma alone may have been

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the sole factor in the lenticular change. To my mind, however, it offers a certain amount of *vraisemblance.*

TENTH OBSERVATION. — Mr. ———, *aet.* 79, came under my care on August, 24, 1881. Had been operated on for glaucoma two years previously. The whole of the lens of the left eye is opaque and looks whitish, that of the right partly so. Moreover, he is almost stone-deaf. He is highly mineralized —if I may so express myself. He *is fond of salt* and *eats a great deal of it* and puts *salt* into his morning tub for a long time past. He is a fine old gentleman, but from the feel of his pulse, which also intermits, and from his general look it is clear he is a moving mass of mineral. How

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much his salt-eating and salt-bathing may have conduced thereto I cannot say—perhaps not at all. But this is certain, there is improvement in his vision since I began to treat him ; he is *sure* he sees better, and his eyes do not tire so readily. He has left off his salt *almost*, and thus far (Dec. 7, 1881) has had *Chelidonium majus* 1x ; *Sticta pulmonaria* 3x ; and *Pulsatilla Nuttaliana* 2. He has a little psoriasis of the lower extremities.

This having been delayed in the press, I am enabled to add a later note in this case from my case-book. While taking the *Pulsatilla Nuttaliana* his deafness almost disappeared, and the amelioration holds good. It was given because

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of œdema of the *left* upper eyelid. The intermittency of his pulse has disappeared, and he is fresher in his general look. On my advice he no longer puts salt into his morning tub, and has reduced his salt-eating to a minimum. I do not think it necessary to give it up entirely, because a certain quantity can without doubt be eliminated, and then it would not do any harm, and so enough may be partaken of just to give taste to otherwise tasteless food.

Glaucoma.

In connection with this tenth observation, it is to be noted that the eye-disorganisation *began* with glaucoma, of which he was relieved by an operation. Now, glaucoma

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has as its most essential character an increase in the ocular tension, presumably from fluid within, and in this old gentleman, there may have been salt-glaucoma as a start, with consecutive cataract. This is the more probable as the experiments of Kunde on frogs shew that the intraocular tension was first increased when salt was put into their bodies.

Another case of glaucoma that came under my observation, and that had been several times operated on by Mr.——, once unsuccessfully on the left eye (which was then excised), and thrice on the right, which then collapsed;—this other case was one in which there were many remarkable features, and one was the lady's *excessive fondness for salt*, whereof

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she partook very freely indeed. I treated her persistently with medicines and rigid diet, from which salt was *almost* excluded, and that one remaining eye is now a useful organ, sufficient for all the practical purposes of life, including reading and writing.

In fine, I am much disposed to charge the excessive use of salt with the power, in certain cases, of causing glaucoma as well as cataract. Let those whose opportunities are larger than mine prove that I am wrong.

ELEVENTH OBSERVATION.—Miss ———, *aet.* 50, by profession a teacher, came under my observation quite lately. She complains that the sight of her right eye is weak, *i.e.*, the right eye waters when she

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uses it a good deal. An ophthalmoscopic examination shews that the lens of this eye is diffusely opaque; the retina is only obscurely visible. Patient *is fond of salt;* she eats it with most of her food. Although fond of salt, she does not like salty things. The aunt of Miss ——— has also cataract, and is even a much greater salt-eater than Miss ———, as she even puts salt on her bacon. A lady on a visit noticed this aunt's fondness for salt and said "You should not eat so much salt, now you are old, as it dries up the blood so." This is an example of how great truths are often current in the mouths of the people.

TWELFTH OBSERVATION. — Mr. ———, *aet.* 52, a hale and hearty

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looking farmer, came at the beginning of the year under my care. Fourteen years ago had rheumatic iritis which ended in a closure of the pupils. Then iridectomy was performed by a provincial eye-surgeon of good repute; it failed. Subsequently a well-known London oculist performed iridectomy four times with very indifferent results: as soon as each operation was done the part inflamed and became opaque. There is, however, a rudimentary artificial pupil in the left eye, and through this the left lens appears like a little whitish ammonite—a mere dried-up mass. With this left eye he can just distinguish between a horse and a cow, or between a pig and a sheep. It is eleven years since he last saw to

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read a little. What state the right lens may be in is beyond view, as the cornea of this eye is also opaque *Patient is particularly fond of salt.* He thinks his daily average of salt is about two tea-spoonfuls.

Thirty-six years ago he had the itch (caught from a servant); it was cured (?) by what he calls "a nasty stinking ointment."

The thought occurs to me very frequently that psora seems to taint many of the individuals who have cataract and are fond of salt: is the psoric person specially susceptible to the influence of salt? And has he, also, a special liking for it?

Now, I think I may conclude my little treatise; I have shown that common salt is capable of producing

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cataract in healthy lower animals, and I have shewn that persons suffering from cataract are very apt to be fond of salt. It may be said that fondness for salt, being present in many who have no cataract, cannot be any evidence that it really is to be blamed just because a cataractous person happens to eat a good deal of salt. This is granted. Yet I must submit that, quite apart from my little bit of clinical evidence, if salt can cause cataract in the lower animals, it may be fairly inferred that it possesses a like power over the human body. Phosphorus produces granular degeneration as well in animals as in man, and the sum of human experience tends to shew that drugs affect man and

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animals very much alike. There are, it is true, notable exceptions, especially in the neurotics; but, put broadly, what causes tissue degeneration in animals will cause precisely the same thing in man.

Conclusions.

1. Salt causes cataract in the lower animals.

2. As many persons suffering from cataract eat a good deal of salt, it is probable that the salt may have some causal connection therewith.

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3. Therefore persons suffering from cataract should eat but *very* little salt, or give up the salt-eating habit entirely.

4. Cataract is usually considered an evidence of senile decay, and as salt causes cataract, may we not infer that excessive salt-eating tends to make us aged — perhaps even prematurely?

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Is Salt a Food?

I have just said that salt-eaters, being the subjects of cataract, should eat but *very little* salt, or give up the habit entirely. Here I shall doubtless be met with the question—But is not salt an absolutely essential part of one's food? This is a broad question that I have just hinted at in the beginning of this little treatise. I am not in a position to answer the question absolutely, but I may offer a few remarks upon it. Individually, I usually eat salt with my food like other people, but not very much. I do not care specially for it, though salted provisions are grateful to my palate. By way of experiment I have gone without salt for three

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months at a time, and felt none the worse. I know a little girl seven years of age who has never tasted salt *as such;* of course it is in most of her cooked food. She is very bonny, of large build, very powerful, enjoys very excellent health, and has no worms. I know a London gentleman, about forty years of age, who has not eaten any salt for fifteen years; he enjoys excellent health, and is a fine handsome man with a singularly healthy look, and he has no worms. It is, therefore, quite sure that there is no danger in very much limiting the quantity of salt partaken of.

These remarks I offer merely to shew that there is, so far as I

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have been able to observe, absolutely no danger in entirely giving up salt as a food, respectively as a condiment with one's food.

Supersalinity of the Blood: an Accelerator of Senility.

When much salt is partaken of, or whenever the out-put of salt, plus what is used up within the organism, is less than the in-put, the blood must necessarily become supersaline; when the blood is supersaline its specific gravity is raised above the normal, and then the senescent effect of the supersalinity must take place. In the lens we have traced this drying-up effect, and we have seen that consentaneously therewith

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there is a drying-up and a shrinking of the tissues of the body.

In the habitually excessive salt-eater the almost constant presence of a plus of salt in the blood as it courses all over the body must affect the tissues in the *same* way. It may affect one part of the body more readily than another, *i.e.*, it may have an elective affinity for any given organ or part, but when any given substance is capable of effecting tissue degeneration, that degeneration is the *same in kind* in every part, though it may differ in degree.

Supersalinity of the blood causes a senile change to take place in the lens—that is proved, for it can be seen and demonstrated. The process that visibly takes place in the

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lens goes on invisibly in the other tissues at the same time; there is no escaping from this conclusion. It therefore follows that the excessive ingestion of common salt, and of other substances that raise the specific gravity of the blood, *must* tend to mineralize the tissues and thus accelerate senility. Hence "Supersalinity of the Blood" *is* an "Accelerator of Senility and a Cause of Cataract."

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